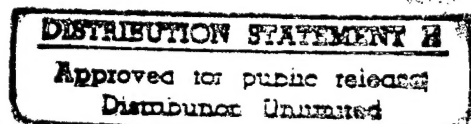


FINAL REPORT  
AUGUST 1996

## REPORT NO. 96-70

# 40MM (M781) PROJECTILES IN WIREBOUND BOX UNITED NATIONS (UN) PERFORMANCE ORIENTED PACKAGING (POP) TESTS



Prepared for:  
U.S. Army Armament Research, Development  
and Engineering Center  
ATTN: AMSTA-AR-ESK  
Rock Island, IL 61299-7300

19970616 035

VALIDATION ENGINEERING DIVISION  
SAVANNA, ILLINOIS 61074-9639



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FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct United Nations (UN) Performance Oriented Packaging (POP) tests on 40MM (M781) projectiles in a wirebound box so this item can be shipped IAW UN POP requirements. This report contains the test results.</p>					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION <b>UNCLASSIFIED</b>		
22a. NAME OF RESPONSIBLE INDIVIDUAL <b>JEROME H. KROHN</b>			22b. TELEPHONE (Include Area Code) <b>815-273-8929</b>		22c. OFFICE SYMBOL <b>SIOAC-DEV</b>

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL  
VALIDATION ENGINEERING DIVISION  
SAVANNA, IL 61074-9639

REPORT NO. 96-70

40MM (M781) PROJECTILES IN WIREBOUND BOX UNITED NATIONS (UN)  
PERFORMANCE ORIENTED PACKAGING (POP) TESTS

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## PART 1

### INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct United Nations (UN) Performance Oriented Packaging (POP) tests on 40mm (M781) projectiles in a wirebound box for compliance with UN POP requirements.

B. AUTHORITY. This program was conducted IAW mission responsibilities delegated by the U.S. Army Materiel Command (AMC), Logistics Support Activity Packaging, Storage, and Containerization Center (LOGSAPSCC). Effective 9 July 1993, the three letter designator "DEV" was assigned for use when conducting UN POP tests. Effective 9 August 1994 this designation was included in the Joint Regulation AR 700-143, Performance Oriented Packaging of Hazardous Materials.

C. OBJECTIVE. To determine if this item meets UN POP requirements.

D. CONCLUSION. As tested, the 40mm (M781) projectiles in a wire boundbox met all UN POP requirements with no problems encountered during testing.

PART 2

AUGUST 1996

ATTENDEES

William R. Meyer  
General Engineer  
DSN 585-8090  
815-273-8090

Bradley J. Haas  
Mechanical Engineer  
DSN 585-8336  
815-273-8336

Director  
U.S. Army Defense Ammunition Center  
and School  
ATTN: SIOAC-DEV  
Savanna, IL 61074-9639

Director  
U.S. Army Defense Ammunition Center  
and School  
ATTN: SIOAC-DEV  
Savanna, IL 61074-9639

## PART 3

### TEST PROCEDURES

The test procedures outlined herein were extracted and summarized from the Bureau of Explosives (BOE) Tariff No. BOE-6000-L, Subpart M, Section 178.600. All tests were conducted to Packing Group II requirements.

A. Drop Test. Each package will be dropped onto a nonyielding surface from the height and orientations listed below. The drop height is measured as the vertical distance from the target to the lowest point on the package. The drop height for Packing Group I is 1.8 meters (5.9 feet), for Packing Group II it is 1.2 meters (3.9 feet), and Packing Group III is 0.8 meters (2.6 feet).

Packaging	No. of tests	Drop orientation of samples
Steel drums, Aluminum drums, Metal drums (other than steel or aluminum), Steel jerricans, Plywood drums, Wooden barrels, Fiber drums, Plastic drums and jerricans, Composite packagings which are in the shape of a drum.	Six — (three for each drop) . . .	First drop (using three samples): The package must strike the target diagonally on the chime or, if the packaging has no chime, on the circumferential seam or an edge. Second drop (using the other three samples): The package must strike the target on the weakest part not tested by the first drop, for example a closure or, for some cylindrical drums, the welded longitudinal seam of the drum body.
Boxes of natural wood, Plywood boxes, Reconstituted wood boxes, Fiberboard boxes, Plastic boxes, Steel or aluminum boxes, Composite packagings which are in the shape of a box.	Five — (one for each drop) . . .	First drop: Flat on the bottom (using the first sample). Second drop: Flat on the top (using the second sample). Third drop: Flat on the long side (using the third sample). Fourth drop: Flat on the short side (using the fourth sample). Fifth drop: On a corner (using the fifth sample).
Bags — single-ply with a side seam.	Three — (three drops per bag) .	First drop: Flat on a wide face (using all three samples). Second drop: Flat on a narrow face (using all three samples). Third drop: On an end of the bag (using all three samples).
Bags — single-ply without a side seam, or multi-ply	Three — (three drops per bag) .	First drop: Flat on a wide face (using all three samples). Second drop: On an end of the bag (using all three samples).

B. Stacking Test. The test sample must be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages which might be stacked on it during transport. The minimum height of the stack, including the test sample, must be 3.0 meters (10 feet). The duration of the test must be 24 hours, except that plastic drums, jerricans, and composite packaging 6HH, intended for liquids, shall be subjected to the stacking test for a period of 28 days at a temperature of not less than 40 degrees Celsius (104 degrees Fahrenheit). Alternative test methods which yield equivalent results may be used if approved by the Associate Administrator for Hazardous Materials Safety.

C. Vibration Test. Three sample packagings, selected at random, must be filled and closed as for shipment. The three samples must be placed on a vibrating platform that has a vertical or

rotary double-amplitude (peak-to-peak displacement) of one inch. The packages should be constrained horizontally to prevent them from falling off the platform, but must be left free to move vertically, bounce and rotate. The test must be performed for one hour at a frequency that causes the package to be raised from the vibrating platform to such a degree that a piece of material approximately 1.6 mm (0.063 inch) thickness (such as steel strapping or paperboard) can be passed between the bottom of any package and the platform.

D. Pass/Fail Criteria. A package passes the above tests if there is no rupture or leakage from any of the samples. No test sample should show any deformation which could adversely affect transportation safety or any distortion liable to reduce packaging strength.



PART 4

UN POP TESTS

40mm (M781) Projectiles in Wirebound Box

United Nations (UN) Performance Oriented Packaging (POP) Tests

U.S. Army Defense Ammunition Center and School

SIOAC-DEV, Savanna, IL 61074-9639

815-273-8908

Jerome H. Krohn

Test Report Number: 96-70

Service Code: DEV

Product NSN: 1310-01-211-8073

Nomenclature: 40mm (M781) Projectiles in  
Wirebound Box

Shipping Name: Cartridge small arms

UN ID Number: 0339

Hazard Class: 1.4C

Packing Group: II

Physical State: Solid

NALC/DODAC: None

CAA Number: None

EX Number: None

CFR 49 Packaging Method: US005

Net Explosive Weight: .000373 kg (.000823 lbs)

DESCRIPTION OF PACKAGINGS TO BE TESTED

EXTERIOR CONTAINER

Exterior Container: Natural Wood Wirebound Box

CFR 49 Reference Number: 173.62

UN Code: 4C1

NSN Exterior Container: None

Specifications: MIL-B-46506

Drawing Number: N/A

Net Quantity Weight: 30 kg (65 lbs)

Tested Gross Weight: 35 kg (76 lbs)

Dimensions Interior: L-22-1/2" X W-10" X H-11"

Manufacturer: Unknown

Year Container Manufactured: Unknown

Drawing Number(s): 9381657

Cushioning: Cardboard fill as required to form a tight pack.

Closure: 3 wire fasteners

#### INTERMEDIATE CONTAINER

Intermediate Container Description: Fiberboard boxes

Specification Number: ASTM D 5118

Container NSN: N/A

Intermediate Container Cushioning: Partition - 9325892, 9325893

Intermediate Container Closure Method: Tape

Intermediate Container Dimensions: L-9" X W-9" X H-4-3/4"

Number Of Intermediate Containers: 4

#### UNIT CONTAINER

Unit Container Description: N/A

Unit Container Specification: N/A

Unit Container NSN: N/A

Unit Container Cushioning: N/A

Unit Container Closure Method: N/A

Unit Container Dimensions: N/A

Number of Unit Containers: N/A

## SPECIAL NOTES

All exterior, intermediate, and unit containers must be inspected prior to use. Inspect for physical damage and structural integrity of the containers.

## SUPPLEMENTAL INFORMATION

Permitted Transportation Modes: Military or DOD licensed truck and rail,  
Military or DOD licensed ship,  
Military or DOT licensed aircraft

Specific Gravity: N/A

Hydrostatic Test Pressure Applied: N/A

Leakproofness Test Pressure Applied: N/A

## TEST PROCEDURES

<u>Tests Conducted</u>	<u>Test Method</u>	<u>Test Results</u>
(1) Pre-Conditioning (fiberboard)	Part 178.602	N/A
(2) Drop Test	Part 178.603(e)(1)(ii)	Pass
(3) Leakproofness Test	Part 178.604	N/A
(4) Hydrostatic Pressure Test	Part 178.605	N/A
(5) Stacking Test (1,500 lbs)	Part 178.606(c)(1)	Pass
(6) Vibration Test	Part 178.608(b)(3)	Pass

POP Marking

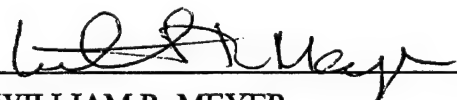
u 4C1/Y35/S/\*\*

n USA/DOD/DEV


\*\* Year of Manufacture

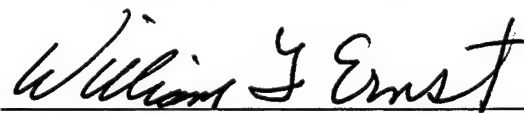
### CERTIFICATION

Unless expressly stated to the contrary, we certify that all of the above applicable tests have been performed in strict conformance to CFR 49, Subpart M, Parts 178.600 - 178.608. Based on the successful test results shown above, this container is deemed suitable for transport of the hazardous material described herein, provided that maximum tested weights and quantities are not exceeded and the packaging is assembled as tested. The use of other packaging methods or components may make this test invalid.

PREPARED BY:  DATE: 19-MAR-97  
WILLIAM R. MEYER  
Test Engineer

PREPARED BY:  DATE: 19 March 97  
BRADLEY J. HAAS  
Test Engineer

SUBMITTED BY:  DATE: 19 March 97  
JEROME H. KROHN  
Chief, Validation Engineering Division

APPROVED BY:  DATE: 19 MARCH 97  
WILLIAM F. ERNST  
Chief, Logistics Engineering Office

PART 5

PACKAGING DRAWINGS

## PACKING COMPONENTS

- 4 - BOX INNER - 9325894  
BOX, WIREBOUND, PACKING - 9381657  
FILLER, END - 9325896 - 1  
9 - 1/8 X 8.7/8 - 1/8  
NOTES: 2, 3

FILLER, TOP/BOTTOM/SIDE - 9325896-2  
9 3/8 - 1/8 X 9 - 1/8  
NOTES: 2, 3

## NOTES:

- 1 - SPEC MIL - A-2550 APPLIES.  
2 - QUANTITY: - AS REQUIRED.  
3 - MATERIAL: - FILLER, SHEET FORM,  
SPEC MIL - F-50449.

## MARKING INSTRUCTIONS

- M1 - THE BOX SHALL BE MARKED IN  
ACCORDANCE WITH DWG. 8796522.  
M2 - THE DESCRIPTIVE NOMENCLATURE  
SHALL BE:  
100-CARTRIDGE 40MM PRACTICE M781  
OR  
1310-01-211-8073-8519  
AS APPLICABLE  
M3 - NSN AND DODIC SHALL BE:  
1310-01-148-8881-8519  
M4 - PROPER SHIPPING NAME AND IDENTIFICATION  
NUMBER SHALL BE:  
CARTRIDGES FOR WEAPONS, INERT  
PROJECTILE UN 0339

## PACKING INSTRUCTIONS

- P1 - REMOVE ALL LOOSE SPLINTERS FROM  
INSIDE THE BOX.  
P2 - ASSEMBLE THE WIREBOUND BOX AND  
PLACE A FILLER INTO THE BOTTOM  
OF THE BOX.  
P3 - PLACE THE FOUR BAGGED BOXES ON  
THEIR SIDES INTO THE CONTAINER.  
P4 - PLACE AN END FILLER ON EACH END,  
A SIDE FILLER ON EACH SIDE, AND  
A TOP FILLER ON TOP.  
P5 - PLACE ADDITIONAL FILLERS ON ENDS,  
SIDES AND TOP AS REQUIRED TO  
FORM A TIGHT PACK.  
P6 - CLOSE AND SEAL THE BOX IN  
ACCORDANCE WITH DRAWING 8796522.  
P7 - FOR PACKING OF LIGHT BOXES  
SEE DRAWING 9325874.

## REUSE

REUSE OF PACKING MATERIALS (EXCEPT FOR BARRIER BAGS)  
IS PERMISSIBLE IF CONSIDERED ECONOMICALLY FEASIBLE  
AND IN REUSEABLE CONDITION BY THE PROCURING ACTIVITY.  
FOR REUSE INSTRUCTIONS SEE DRAWING 8796522.

DISTRIBUTION STATEMENT X  
DISTRIBUTION AUTHORIZED TO US  
GOVERNMENT AGENCIES AND PRIVATE  
INDIVIDUALS OR ENTERPRISES ELIGIBLE  
TO OBTAIN EXPORT-CONTROLLED  
TECHNICAL DATA IN ACCORDANCE WITH  
CONTROLLING DOD OFFICE IN DOD  
5230-25; 52-09-08; ARDEC,  
SMCAR-ESW-A, ROCK ISLAND, IL.

THE CUBICAL DISPLACEMENT SHALL BE: 1.5

M5 - POP MARKING, IAW DRAWING 8796522, SHALL BE

MARKED WITH THE FOLLOWING INFORMATION:  
11 4GVY28/S/LAST TWO DIGITS OF YEAR PACKED  
11 USA/DOD/AYD

PART NO. 9325896

WEIGHTS (ESTIMATED)		NAME OF PART		LBS.	DO NOT SCALE DRAWING UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES		ORIGINAL DATE OF DRAWING 77-08-30		U.S. ARMY AMMUNITION RESEARCH AND DEVELOPMENT CENTER DOWDA, NEW JERSEY 07041	
1	BAGGED INNER BOXES	48.0								
2	WIREBOUND PACKING BOX	12.0								
3	FILLERS	1.0	FINAL	M781						
4			REAR ASST	USED DN						
5	TOTAL	61.0	APPLICATION							
					JIM SPILMAN		FSCM NO		9325896	
					PHILIP KORMAN		SCALE		UNIT WT.	
							C 19200		SHEET	

PACKING AND MARKING

FOR BOX, PACKING

APPLICATION			REVISIONS		
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL
9325893	X781	-	ENR A7X2524	77-08-30	GH
		A	NOR A852521 78-12-14	79-3-8	GH

5 X 5 PATTERN

CELL SIZE 1 21/32 SQUARE X 3 1/2 HIGH

NOTES:-



- 1- SPEC MIL-A-2550 APPLIES.
- 2- MATERIAL:- FIBERBOARD, TYPE CF, CLASS DOMESTIC, VARIETY SW, GRADE 125, "B" FLUTE, SPEC PPP-F-320.
- 3- PARTITION SHALL BE SNUG SLIDE FIT IN INNER BOX, 9325893.

CODE IDENT NO.

19200

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND  
DOVER, NEW JERSEY 07801

PART NO. 9325892

ORIGINAL DATE OF DRAWING 77-08-30		<del>US ARMY MUNITIONS COMMAND</del> <del>PICATINNY ARSENAL DOVER, NEW JERSEY 07801</del>	
DRAFTSMAN EB	CHECKER	PARTITION, HALF-SLOTTED	
ENGR GH	ENGR		
ENGR	ENGR		
		SIZE A	CODE IDENT NO. <del>19200</del>
		SCALE	UNIT WT
		SHEET	

APPLICATION			REVISIONS		
WEEK ASST	USED ON	SYM	DESCRIPTION	DATE	APPROVAL
9325894	M791	B	NOR M5Q2017 / 950424	950809	DR

INSIDE DIMENSIONS 8 13/16 SQUARE X 4 1/4

TOLERANCES ON INSIDE DIMENSIONS + 1/16

ADVISORY OUTSIDE DIMENSIONS 9 1/8 SQUARE X 4 3/4

NOTES:

1- SPEC MIL-A-2550 APPLIES.

2- MATERIAL- BOX, FIBERBOARD, TYPE CF, CLASS DOMESTIC,  
VARIETY SW, GRADE 125, "B" OR "C" FLUTE,  
STYLE RSC/Q201, ASTM D5118.

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND  
DOVER, NEW JERSEY 07801

DISTRIBUTION STATEMENT A.  
APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

PART NO. 9325893

ORIGINAL DATE OF DRAWING 77-08-30		US ARMY MUNITIONS COMMAND PICATINNY ARSENAL, DOVER, NEW JERSEY 07801		
DRAFTSMAN ES	CHECKER	BOX, INNER		
ENGR ST	ENGR			
ENGR	ENGR			
For Spilman		SIZE A	CODE IDENT NO. 19203	9325893
Philip Vorma		SCALE	UNIT WT	SHEET



PART 6

HAZARD CLASSIFICATION

USATCES JOINT HAZARD CLASSIFICATION SYSTEM  
LIST OF DATA FROM QUERY BY NSN

Query Date - Aug 08, 1996

COM TSC -----NSN----- DODIC -----ITEM NOMENCLATURE-----  
A Y 1310-01-211-8073 B519 CARTRIDGE, 40MM, PRACTICE, M781, 100 RDS/WBO BOX

IBD	HCD	CG	L1	L2	L3	UNS	DER	HEW-LBS	HEW-KGS	NPW-LBS	NPW-KGS
	1.4	C	4			0339	8904055	.000051	.000023	.000772	.000350

NEW-LBS	NEW-KGS	NEWQD-LBS	NEWQD-KGS	HSC	PART-OR-DWG-NO-1	PART-OR-DWG-NO-2
.000823	.000373	.000823	.000373		9322240	9395853

PART-OR-DWG-NO-3 TECHNICAL NAME  
3325896

PACKAGING CAA

PROPER SHIPPING DESCRIPTION

CARTRIDGES FOR WEAPONS, INERT PROJECTILE or

CARTRIDGES, SMALL ARMS 1.4C UN 0339 PGII

ISN	COM DOD COMPONENT	TSC	TRI-SERVICE COORDINATION
.310-01-211-8073	A ARMY	Y	YES

DL1	DL2	DL3	DOT LABEL
4			EXPLOSIVE 1.4

SC HAZARD SYMBOL

MEANING

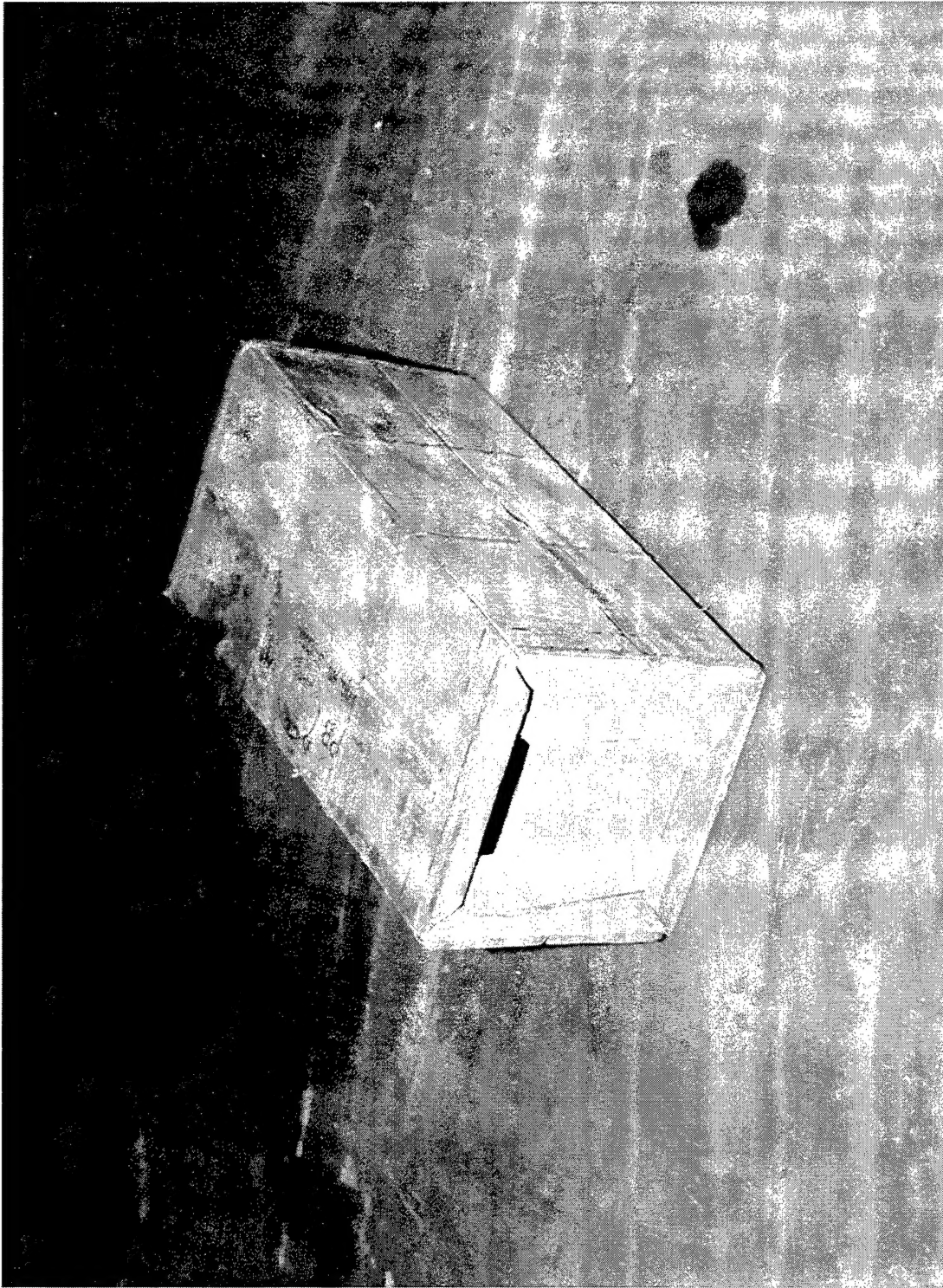
CO HAZARD CLASS DIVISION  
.4 MODERATE FIRE, NO BLAST OR  
FRAGMENT

CG COMPATIBILITY GROUP  
C PKGD PROPELLANTS/PROPELLING CHARGES,  
DEVICES CONTAINING PROPELLANT

END OF LIST

PART 7

PHOTOGRAPH



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
USADACS-DEV-96-70-01. This photo shows an overview of the item tested.		